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NOTICES OF ENGLISH PATENTS.

To Miles Bery, for the process now known as the Daguerreotype, being a communication from a foreigner residing abroad—14th August, 1839.

This is a most remarkable case of a patent, and calculated somewhat to dim the lustre of M. Dagueni's fame. It is well known that the French government gave to the inventor of this process and to his partner, a liberal annuity, and much noise was made about the liberality of the French nation—rewarding her artists and giving the world the result of their labors. When the arrangement with the French government was concluded, M. Daguenis communicated his prowess to M. Bery, patent agent, and received his letters patent a few days previous to the promulgation in France. Then persons who had paid the exorbitant price demanded for the apparatus, countersigned by Mr. Dauguenis himself, were prevented from using the same, until they had taken out and paid for a licence. In all this, perhaps, there is nothing illegal, but there is certainly something very mean, after all the parade of "liberality," "glory," &c. So at least thought certain gentlemen, artists and amateurs, who, doubting the fact that M. Dagueni had authorised this proceeding, addressed him a letter, asking for information. They received a very polite letter, acknowledging the fact, and stating that Mr. D. had given the secret to the French nation, and not to the world!

To William Vickers, for a mode of obtaining tractive power, from carriage wheels, under certain circumstances.—6th March, 1839.

The invention is a mode of coupleing the driving and running weeels of a locomotive by a an endless band passing over pullies on the ends of the axles.

Z. Mores Poole, for improvements in constructing and applying boxes to wheels—from a foreigner, residing abroad.—29th Feb. 1839.

Iron boxes are to be screwed into the wooden naves.

To Thomas McGaman, manufacturer of paper, from a material not hitherto employed.—26th August, 1839.

This improvement is the use of the hop vine. The patentee is in error in stating that this is a material never before used in making paper.—Many years ago a namesake of our own, in Germany, published a book on paper making, to which was affixed specimens of paper from every imaginable source down to potatoes; straw, and various other common stalks were among the number, and we think the hop plant also. It appears too, that the experiment, was tried elsewhere.

To Mores Poole for obtaining rotary motion—being a communication from a foreigner residing abroad.

This patentee possessed with a firm conviction of the great loss of power in the crank, produces the following contrivance to supersede the use of the crank in all kinds of machinery. Around a cylinder on the shaft to be moved, is cut an oblique groove, returning into itself; a pin in the piston rod presses against the side of this groove, and causes the cylinder to revolve. Besides not being good for any thing (at least as a mode of communicating power,) this contrivance is not new.

To Antonio Morillon, for improvement in machinery for propelling ships, boats, and other vessels on water, designed to supersede the use of paddle wheels.

The improvement consists in the use of expanding paddles, after the manner of a duck's foot. This and all similar attempts to "supersede the paddle wheel," are founded on an erroneous idea of the great loss of power in the ordinary paddle wheel. The greater complication of parts, and in general, the enormous increase of friction, render such invention impracticable.

To the Editors of the Railroad Journal and Mechanics' Magazine.

Engineers' Camp, Harrisburg and Pittsburg Railroad Survey, July 13th. 1840.

GENTLEMEN:—You will please to insert the following remarks, intended as a reply to Mr. B. Aycrigg's communication on the *Theory of the Crank*, as far as the position is concerned, which has been assumed by me in this matter, and which as yet stands unimpaired.

Mr. Aycrigg says on page 325 of the same number, that if power was lost, by changing a straight into a rotary motion, *we may gain by reversing the action, and converting the circular into a rectilinear motion, and consequently construct a perpetual motion.*

To this I reply, that if we could change a rotary motion into a straight motion, *without applying a straigh motion*, we would accumulate power.

But since this is impracticable, and since a rotary motion, produced by a previous straight motion, causes a *loss* of as much useful power, as the change from a rotary motion into a straight motion will cause a *gain* of useful power, the *loss* will balance the *gain* during the action of the machine

and there can therefore be no accumulation of power, hence no chance of a *perpetual motion.*

The same gentleman continues on the same page:

"In the first case, where the power acts in parallel lines, we have precisely the condition of gravity, causing the descent of a heavy body on a curved inclined plane. Here it has been generally conceded that no power is lost."

In answer I beg leave to remark, that the question of the motion on a *curved or inclined plane*, and the *crank* or *rotary* motion, rest upon the same principle, and they must either stand or fall together. The principle I contend for, is: that when a body has received an impulse of motion, this impulse will continue to operate in the same direction, unless the course of motion is checked, and if then, the force of the impulse be not allowed to develope itself freely, the *momentum of the impulse will loose some power.*

Though the change of motion, and consequent reduction of power, may be very small indeed at a time, yet a continuous succession of such small losses will produce something very material. Mr. Aycrigg then offers a *more conclusive mode of investigation*, and says:

"Take the first case, where the power acts parallel,

$$P : f : : R : \sin c$$

$$V : v : : \sin c : R$$

$P.V = f.v$. But $P.V$ is the expense of power, and $f.v$ the effect, therefore we see, that there is no less of power."

To this the following is offered, using the same signs and letters:

The first proposition,

$$P : f : : R : \sin c$$

I admit as correct. But I object to the second, and confess to be at a loss to understand how it could be admitted by the mathematical talent of the distinguished writer.

Without referring to a diagram, it will be agreed on, that the respective velocities of the *prime mover*, and of the *crank-pin*, are as the *spaces* through which they have actually moved.

Now if the angle, included by the direction of the prime mover and the crank, is denoted by *c*,

The measure of the space, through which the prime mover has actually moved, will be equal to the *sine verse* of the angle *c*.

And the space through which the crank-pin has moved at the same time, must be represented by the *arc*, belonging to the angle *c*.

Therefore the following proportion will be admitted as correct:

$$V : v : : \text{Sine verse } c : \text{arc } c$$

Mr. Aycrigg's proportion is,

$$V : v : : \text{Sines } c : \text{Radius}$$

and if correct, the following proportion should also be right:

$$\text{Sine verse } c : \text{arc } c : : \text{Sine } c : R$$

But this is evidently incorrect, as the Sine verse can bear no *definite* relation to an arc or the circumference of a circle.

The error will become more apparent, by supposing the angle c equal to 90 degrees. Then the sine verse will = R and the sine = R

Hence R : arc 90° : : R : R

Therefore : the arc of the quadrant = Radius

This being a *reductio ad absurdum* the above positive demonstration must be rejected.

Let me conclude with the remark, that although most investigations, presented to the scrutiny of the human mind, are more or less to be conducted on the principle of *compromising contending views*, such sort of reasoning should never be allowed to enter the field of mathematical researches. All arguments on this science should be directly to the point, and be based upon indisputable axioms, and when a new proposition is offered and opposed, let the error in the reasoning be clearly pointed out.

Yours, very respectfully,

JOHN A. ROEBLING, C. E.

For the American Railroad Journal and Mechanics' Magazine.

The rise and progress of this nation, with the incalculable benefits it has conferred on the civilized world, and which it bids fair to confer till the end of time, justly excites proud and patriotic feeling in the heart of every American. If we judge from the signs of the times and the history of the past, we may conclude that this nation is destined by providence to take the lead in the great struggle for man's moral and mental melioration, and the final enlightenment of the whole world. But man in this and every age, is imperfect, and as we look back through the long line of his history, we find that all his best endeavors and loftiest attainments, have been stained by error, and defaced by evil. How often do we find religion accompanied by zeal without knowledge, degenerating into intoleracne. Science without study or thought becoming sciolism, and liberty without moderation, due fore thought and check, becoming licentiousness! Critics in the old world and in the new, have long complained of the feebleness of American literature, and have at length come to the conclusion, that as a people we are too active, that our efforts spread over a large surface, becoming hurried rather than strong, have rendered us superficial;—that we are too much absorbed in the cares and business of life to produce great scholars, and too much enfeebled by the "auri sacra fames" to find leisure for the pursuits of poetry and art. Without stopping to remark farther upon this head, we will proceed to trace the effects of this superficiality, to which, as a nation, we must plead guilty, upon mechanism, and the mechanic arts. We do not remember to have heard this subject spoken of either by scientific or literary men, and as page upon page have been written upon the effects of superficiality upon literature and philosophy, and nothing upon its effects on the mechanic arts, we are led to conclude that the public either think that sound ac-

quirements in this department of knowledge are of little importance, or that a sufficient amount of study is already invested in it. We now assert that *in the various trades and arts in which American industry exerts itself, there is not sufficient study upon correct theory, and not sufficient practice in the manipulations.* Let not the objector meet us here by telling us that our country is the "country of improvements"—that no portion of our planet was ever so rapidly transformed from wild forests to clutivated fields, —that in no part of the world has man so nearly realized the lover's wish in Shakspeare, of annihilating time and space. True, we are proud to say that, if we except the art of printing, the most important invention made by man, and which, next to printing, is the most important element in the world's civilization, was the product of American mind; we are proud that our country, although numbering two millions of square miles in extent, is so intersected by canals and railroads, that it forms one vast *neighbourhood* of enterprising and improving men. We have made a good be ginning, but now that our resources are multiplying, our nationality is forming, and we are rapidly acquiring strength as a people, we should look beyond the present, and think and act for posterity. Our efforts and enterprize have been hitherto directed to *immediate* profit and utility. We have endeavored to advance and accomplish as cheaply and expeditiously as possible. Our railroads, bridges, canals, public edifices, and machinery, have been constructed "for the nonce," as it were. We are not blaming our countrymen in these remarks, but now that the beginning has been made, and the gristle of our young republic is hardening into bone, and its thews and sinews are becoming strong and matured, let us do worthy of our resources, our native talent, our destiny. 1. Take for example the art of Architecture. Consider the vast amount expended in the construction of buildidgs, public and private; and how few there are in the United States, which will last for centuries, and become hallowed by glorious associations, and rendered sacred as "chronicles of Eld." Our own city contains few edifices which are at all worthy of American enterprise,—and in others the number is still smaller. Indications we do see however, that more attention is beginning to be paid to architecture, and we may anticipate triumphs worthy of old Greece or Rome. 2. In our canals and railroads the same fault is evident: in ths first there are too many locks—in the second, too many curves; we build too cheaply. The Erie canal is an evidence. Circumstances rendered it necessry to construct it as narrow and as cheaply as possible—we doubt not that good policy was at helm; but it would not be politic or prudent at the present day to construct another in the same manner. Our rail cars ascend too great inclinations; many are the contrivances for obtainning a sufficient amount of friction in order to ascend a *steep hill*, the contrivers forgeting that for every I8 feet ascent per mile, one third more power is required than would be necessary on a level; and thus in passing over millions of miles (as some of our rail cars do in a year) much in the end is lost by "*cheap railroads.*" 3. The engineer's art has been sadly neglect-

ed and perverted. The steam engine, the mightiest and most wonderful machine ever made by man, the most cunning in its construction, and which of all others requires deep study and long and skilful practice in order to ensure success in its operation, has become a play-thing in the hands of smatterers and novices. A machine which brings with it intercourse, civilization and good feeling, between the people of different nations, which makes them neighbors assimilates their interests, character and feelings, wears off national prejudice and national jealousy—which should prove a blessing to man, has in our own country been the cause of "mourning, lamentation, and wo." Say not that the immense amount of good which it has already accomplished, more than balances the horrid and sudden death of thousands. Can you sooth the widow in telling her of the immense flood of wealth which the steam engine is pouring into the country? Can you dry the orphan's tear by enthusiastic eulegia upon the enterprise and energy of American industry? Call it not sentimentallity to sympathise with the mourning one though at the expense of national glory. Alas with man in the mad race for wealth and power, the lamentations of the bereaved are lost in the din of "the pomp and circumstance of glorious war," and the death of thousands by an agent of nature which *can* be curbed and controlled is forgotten amid the treasures which it strews in our pathway. That the lives of *all* who have been lost by what are by courtesy called "accidents" on board of steamers, could have been prevented by proper knowledge, and care is not to be questioned. Steam of too high pressure, and boilers of too poor construction have been too generally used. 4. As a body we fear that our engineers are not men who would compare favorably with those of England or France. We have too many *soi disant* engineers and too few who are worthy of the name. We are of opinion that engineers should be *students*, as well as the candidates for the "learned professions," nay *this* should be a "learned profession." Let there be a "society of civil engineers," whose business is to patronise, instruct, and send forth native talent, which shall do honor to the counrry, and write for themselves a history which shall be read by future times in noble bridges spanning great rivers, in "cloud capt towers," and in railroads and canals which shall convey man with the safety, pleasure and security of a morning walk, and with the swiftness of the morning light. Let our country take the lead in the onward march of science, let her enterprise and talent be faithfully *scientifically* and dillegently employed in "internal improvements." Let her works of art be models and not copies—let her engineers be *studious and careful* and we care not how fast they proceed, how much they innovate—provided they proceed upon "grounded conclusions," and scientific theory. Then may they hold to the entusiastic opinion of Brindley, and declare that the "Father of Waters" was made for a canal feeder, and the "everlasting hills to be tunnelled!

W. S.

The following communication presents a dismal picture of the untoward state of affairs as regards internal improvements in Illinois. Not that it is to be considered as offering arguments against internal improvement, but as affording a useful lesson on the mistaken plan of doing every thing at once, and nothing well.

Had the entire system for the State been carefully and judiciously matured, making a sufficient allowance for all probable increase in population and traffic—and then when so matured, taken up item by item as the immediate wants of the State required, we should not have heard of doings which unfortunately, have left such enduring monuments as to injure, we fear seriously, the good cause in that State at least.

A good system for the whole State, by no means requires simultaneous construction throughout the State. Each work may be undertaken as the traffic demands, and the funds allow; and yet when completed, is in no danger of being superseded by some other line; but each being a member of the whole, performs its parts both as an individual, and as a member.

It is reasonably to be supposed, however, that the cause of much of this ill-timed work, may be found in something else than an over-zealous patriotism in promoting Internal Improvements.

"From your connexion with Internal Improvements, you no doubt would feel some interest in knowing what has become of the "*splendid* system," projected and put in practical operation by the great state of Illinois,—the "*infant Hercules.*"

"Of something over 300 miles put under contract in '39, only 24 miles are completed, and in opperation, (from Meridocia, on the Illinois River, to Jacksonville.)

The graduation is completed on many *detatched portions* of all the different roads, and in many cases, something had been done towards the superstructure, but the pressure of the times—the failure of the State to obtain funds with which to meet the estimates, have forced the contractors to abandon their work, and there is not to my knowledge, one now at work in the state.

The system thus far has opperated injuriously, for the interest and credit of the State, and all classes of community. For the state *individually*—by prosecuting so many roads at one time, some of which were acknowledged to be of but little if any advantage, either to the commercial or agricultural interest of the State, by proceeding blindly to become involved to the contractors, before they had secured a sufficiency on permanent loans to meet the contracts; and by finally having a million of dollars of her own *promisory notes*, (and her scrip is hardly that) depreciated 100 per cent in her own state. Injuriously for the farmer, as he has been flattered into the feeling that he would by this system be secured a home market for all his produce, at as good, if not better prices, than could be obtained in the South or East. For the merchant, as where they have credited the contractors, they

have had to wait an unusual length of time, and finally take their dues in irredeemable scrip.

It is extremely doubtful with the most intelligent "suckers," whether the State will ever complete one half she has attempted.

At some future time, if I have leisure, I may give you some detailed statistics of our system for publication.

Yours respectfully, &c."

It is very seldom that we so far infringe upon the privacy of our correspondence, orthe patience of our readers, as to dole out to them the commendations of our personal friedds. We have often been advised to do so, but we must confess our great unwillingness to parade such things before our readers, however much they may contribute to our personal gratification.

We have, however, at precent a case before us, which not only demands our warmest thanks, but public thanks, although from delicacy we withhold the name. The gentleman is a distinguished engineer, and though well known to us by reputation, we are without the pleasure of a personal acquaintance. The communication was of course entirely unexpected and unsolicited. But when we are tendered *two years' subscription in advance* with a compliment in the bargain, we cannot refrain from giving our readers a testimony so highly gratifying and a guarantee for future endeavors on our own part.

"*July 9th*, 1840.

GENTLEMEN—I enclose a ten dollar note, to cover my subscription to the Railroad Journal, for two years from July 1st 1840, in advance. Up to that date my subscription is paid. * * * * * * I am very glad to see the manifest improvement in your Journal, both in appearance and matter, and hope you may enjoy the success which your industry and enterprise richly merrit.

Very respectfully, &c."

AN ESSAY ON THE BOILERS OF STEAM ENGINES, *their calculation, construction, and management with a view to the saving of fuel, including observations on railway, and other Locomotive Engines, steam navigation, smoke burning, incrustations, explosions, etc., etc.* By R. Armstrong, Civil Engineer.

Having procured this work for our own use, we have examined it carefully, and altho' not enabled on a first examination to pronounce upon certain portions—we see nothing so far to prevent us from warmly recommending it to engineers. The subject is well handled, and in such a practical manner, that it is brought within the comprehension of every class, while its results are followed up with immediate referrence to their mechanical application. There are some remarks upon explosions which strike us as sensible, and deserving consideration.

ANNUAL REPORT OF TRANSACTIONS OF THE INSTITUTION OF CIVIL ENGINEERS.—Session 1840.

The council of the institution of civil engineers, on resigning the trust confided to them by the last annual general meeting, solicit the attention of this meeting, and of all those who are interested in the welfare of the Institution, to the following report on the proceedings and on the state and prospects of the Institution at the close of this the 21st year of its existence. At the last annual general meeting, the council of the preceding year had the gratification of congratulating the Institution on its then assembling in its new premises, under circumstances which furnished so advantageous a contrast with the condition of earlier years, and such convincing evidence of the steady progress and success which had attended the labors of the council and the co-operation of the general body. And though the year which is now closed upon you may not have been marked by events of so striking a character as the preceding one, the council nevertheless experienced the highest degree of satisfaction in reviewing the proceedings of the session of the year so auspiciously commenced. Aware of the more extensive duties and increased responsibility entailed upon them, the council have endeavored so to direct the affairs of the Institution as to keep pace with its growing importance; and they can with confidence assert, that the proceedings of the last session have not been inferior in interest or importance to those of any preceding session; whilst the attendance at the meetings, and the anxiety which is evinced by strangers to become acquainted with the proceedings and objects of the Institution, shew the estimation in which it is held both at home and abroad, and fully warrant the most sanguine anticipations of its future and continually increasing success.

The attention of the last annual meeting was directed to the expediency of some alteration in the existing laws, particularly with reference to the election of officers and the number of the council. It was suggested that the annual election of the council should be conducted in a sumewhat different manner from that hitherto pursued; that a greater number than that constituting the council should be nominated, and that, consequently, each person at the annual general meeting, instead of, according to the then existing practice, erasing one name and substituting another, should erase as many names as the number on the balloting list exceeded the constituted number of the council. It was also suggested, that it would be for the advantage of the Institution that the council should be increased by the addition of two members: That as some members of the council are frequently prevented by professional engagements from regular attendance, the council should be enlarged to as great an extent as might be consistent with the true interests of the Institution. These and some other suggestions for the better regulation and stability of the Institution were subsequently submitted to a general meeting of members, and now constitute part of the bye-laws of the institution.

The practice of other societies in publishing their transactions in parts, containing such communications as were ready at frequent and short intervals, was briefly touched upon in the last report, and was discussed in considerable detail at the last annual meeting. Such is the nature of some communications, that delay in the publication may be considered not only as a positive injustice to the author, but as detrimental to the cause of practical science and the best interests of the Institution; and if the publication of such papers he delayed until a whole volume is ready, authors

will inevitably avail themselves of other channels for bringing their labors before the world, Add to which, when a whole volume, containing many valuable plates, is to be published, the sources of delay are numerous, and such as cannot be avoided. The council conceive that the experience of the past year has fully borne out the preceding views, and shown the great importance and value of prompt publication. Early in the session the Institution received a most valuable communication from your member, Mr. Parkes. It was considered desirable that the publication of this communication, forming as it did a continuation of his researches already published in the second volume of the transactions, should not be delayed. No other communications being then ready for publication, the council resolved to publish it at once as the first part of the third volume. This has now been for some time in the hands of the public, and the number of copies which have been disposed of shows the great desire evinced to obtain these papers as soon as published. The council have also had still further proof of the importance of this plan. The Institution received during the last session several communications well suited for publication in the transactions, and among them the continuation and conclusion of that already mentioned by Mr. Parkes. Preparations were made for the immediate publication of these papers in a second part; difficulties and delays, which could not have been foreseen or prevented, occurred in the publication of some of them, and thus the second part contained but two instead of nine communications originally destined for it. The greater portion of the remaining seven papers are already printed and the plates engraved, so that the third part will be in the hands of the Institution in a very short time. There are several other valuable communications in the possession of the Institution now in the course of preparation for publication, and which will appear as soon as circumstances will permit.

The minutes of proceedings have been printed at such short intervals, during the session, as the abstracts of papers aud minutes of conversation would furnish sufficient materials. The council conceive that great advantages may, and indeed have resulted from a publicatiou of this nature. An authentic account of the communications is thus immediately furnished, attention is continually kept alive to the subjects which are brought before the Institution, and the statements there recorded have elicited very valuable communications, which otherwisc would very probably never have been called forth. No one can turn over the minutes of the last session without remarking the number and the diversity of the facts and opinions there recorded very many of which were elicited by the statements contained in some written communication, or casually advanced in the course of discussion.

The council cannot omit this opportunity of insisting on the importance of these discussions, in promoting the objects which the Institution has in view. The recording and subsequennt publication of these discussions are features peculiar to this institution, and from which the greatest benefits have resulted and may be expected, so long as the communication of knowledge is solely and steadily kept in view. It would be easy to select many instances, during the last and preceding sessions, of some of the most valuable communications to the Institution, owing their origin entirely to this source. The first communication from Mr. Parkes arose entirely out of the conversations which took place on the superior evaporation of the Cornish boilers being referred to as one cause of the great amount of the duty done by the cornish engines. The communication by Mr. Williams on peat and resin fuel owes its origin to his being accidentally present at the discussion on the uses of turf, in the manufacture of iron: whilst that by Mr. Apsley Pellatt, on the relative heating powers of coke and coal in melting glass,

arose entirely from the discussion of the facts stated by Mr. Parkes respecting the superior evaporation produced by the coke from a given quantity of coals, than by the coal itself. And lastly, the extremely interesting and highly valuable discussion at the commencement of the last session, on the uses and applications of turf; and on the extraordinary coincidence between the results obtaided by Mr. Lowe, Mr. Parkes, Mr. Apsley Pellatt, and Marcus Bull, of Philadelphia, experimenting as they did with totally different views, and under totally different circumstances, must be fresh in the recollection of all present.

But, besides the positive advantages which have thus resulted, and may be expected, from a steady adherence to these practices so peculiar to this Institution, there are others of the greatest value to those engaged in practical science. By this freedom of discussion, statements and opinions are canvassed, and corrected or confirmed, as soon as promulgated—the labors of authors and claims of individuals are made known and secured as matter of history—and attention is continually kept alive to the state and progress of knowledge in those departments of science which it is the especial object of this Institutisn to promote. The council, trust, therefore, that those individuals who have stored up knowledge and facts for many years past, and devoted themselves to some particular branch of science, will consider how much they have in their power to contribute, and how great is the assistance which they can render to the laborers in other branches, and above all, to those who are ambitious of following in their steps, by freely communicating, either orally or in writing, the knowledge which they have collected; so that the records of the Institution may be unparalleled for the extent and correctness of the information which they contain.

The council have endeavored from time to time to direct attention to subjects on which it was conceived communications were needed or desirable, by proposing such subjects as objects for the premiums; placed at the disposal of the council by the munificence of the late president. The communications sent in compliance with this invitation have not been numerous. Two, however,—one by your associate Mr. Jones, on the Westminster sewage, and the other by Mr. Hood, on warming and ventilating, seemed to call for some special mark of distinction.

The communication of Mr. Jones is of the most elaborate and costly description. It consists of a large plan of the city of Westminster, drawn to a scale of one inch to 200 feet, compiled from the originals in the possession of the commissioners of sewers of that district. Upon this are laid down the boundaries of the city, and parishes, and all the principal streets and squares, with the main and collateral lines of sewers, differently colored, so as to be readily distinguished. This, with the Book of Sections, consisting of upwards 100 sheets of tables and drawings of details of levels, lengths, and construction, furnishes an exact and authentic record of a work of great magnitude. Any extended remarks on the benefits conferred on our metropolis, by the system of underground drainage, would be here superfluous. Works of this nature are of the highest public importance, and have been repeatedly the subject of legislatian by both general and local acts. The council conceived that, in awarding to Mr. Jones a Telford Medal in silver, and twenty guineas for this laborious communication, they were bestowing a suitable mark of approbation on the author of a record which is nearly unparalleled, and must be of great value as a source of information in all future works of this nature, when other, and particularly foreign, cities carry into effect a system of drainage, in which they are at present so deficient.

The council cannot pass from this subject without expressing the obliga-

tions which the Institution is under to the chairman and the commissioners of the sewers of the Westminster district. On its being intimated to them that the council wished some account and record of the work over which they preside, permission was immediately given for any person desirous of preparing such account to have free access to all the documents in their possession relating to the subject, and to make such extracts or copies therefrom as could in any way contribute towards this object.

The communication of Mr. Hood contains a detailed account of the principles on which the salubrity of the atmosphere in crowded rooms depends, and the various methods which have been adopted for warming and ventilation. The author has briefly touched on the various modes of warming generally adopted, and points out the great difficulty which exists of preserving those conditions of the atmosphere which are essential to healthy respiration wherever close stoves or surfacec which may become too highly heated are employed. The importance of ventilation, and the success which has attended the adoption of mechanical means in the manufacturing districts, are subjects worthy the attention of all who study the health of those who, from choice or necessity, are exposed to the generally unwholesome atmosphere of crowded apartments. This subject is of the highest importance to the manufacturing poor of this country, who are compelled to work in crowded rooms at high temperatures. The council are aware that much has been done towards this object in some of the large cotton works of Great Britain, and they hope ere long to obtain some detailed account of the means by which this has been accomplished, and the results which have ensued.

The council have also awarded a Telford medal in silver to your associate, Charles Wye Williams, for his communication on the properties, uses, and manufacture of the turf coke, and peat resin fuel; and to Mr. Edward Woods, for his communication on locomotive engines.

The various applications of peat as a fuel had been repeatedly the subject of discussion at the meetings of the institution, and this communication may (as has been already noticed) be attributed to the discussion then going on. It is well known that the attention of Mr. Williams, as mnager of the city of Dublin steam packet company, and otherwise intimately connected with steam navigation in Ireland, has been for many years directed to the application of peat or turf as a fuel. Public attention was more than thirty years ago directed to this subject by Mr. Griffiths, who designated the bogs of Ireland as "mines above ground." The scarcity and cost of coal, as contrasted with the abundant supply and cheapness of peat, had long since led to the use of the latter in the steamers on the Shannon. Its bulk and tendeny to absorb moisture, are however, serious impediments to its use; but these may be successfully combated by care in the preparation. Moreover, the peat properly selected and prepared, being a carbon of great purity, is superior to every other substance, for all purposes of Metallurgy. But, in these researches, Mr. Williams had ulterior objects in view. He sought, by the preparation of an artificial fuel, to form a combination which should closely resemble the best kinds of natural coal, by combining with turf coke, resin, or some other bitumen of great purity, so as to produce a compound in which great heating power should exist in small bulk, and thus avoid the excess of bitumen and deficiency of carbon in the cannel coal, as well as the deficiency of bitumen and excess of carbon in the anthracite. It would be foreign to the object of this report to dwell on the preparation of this fuel, or the purposes to which it is applicable; it will suffice to refer to the numerous discussions on this subject recorded on the minutes of last session, and the paper now published in the second part of the third volume, of your transactions.

The communication by Mr. Edward Woods published in the second volume of the transactions, will always bear a prominent place among the records of practical science, as one of the earliest and most accurate details on the actual working of locomotive engines. The first communication was received early in the session of 1838. The author was thought capable of adding so much to his already valuable communication, that the council referred it back to him for this purpose, and it was not received in the form in which it appears in your transactions, till after the premiums of that session were awarded. But this communication (notwithstanding the interval since it was laid before the meeting,) will probably be fresh in the recollection of most present, from its giving an accurate account of the progress of the locommotive engine on the Liverpool and Manchester railway, from the opening of that important work. The experience of engineers had at that time furnished them with but little knowledge as to what were the most essential requisites in railway engines, and the advance of knowledge as shown by the history of the locomotive engine on this railway, is a most interesting and instructive lesson to every one who would study the progress of practical science and improvement. Great alterations were found necessary in the strength of the parts, in the weight of the engines, in the road, and the number of wheels. The first engines were gradually adapted to the necessities of the case, and the arrangements then resorted to as necessary expedients have now been adopted into the regular and uniform practice. Besides the extreme interest of that which may be termed the history of these improvements, the communication is replete with theoretical principles as to the working of locomotives, and the advantages and disadvantages incident to peculiar practical adaptations. It would exceed the limits of this report to do more on the present occasion than briefly to state that this paper contains extended remarks on the relative advantages of four or six wheels, of iuside or outside framings, of crank axles or outside crank pins, of coupled or uncoupled engines. The council would point out this paper to the junior members of the profession, as an example of how great a service may be rendered by simply recording what passes under their daily observation and experience.

The council have also adjudged a Telford medal in bronze and books to the value of three guineas, to Mr. R. W. Mylne, for his communication on the well snnk at the reservoir of the New River company at the Hampstead road; to Lieutenant Pollock, for his drawings and descripiion of the Coffre dam at Wesminster bridge; and to Mr. Redman, for his drawings and account of Bow bridge.

The cowmunication by Mr. Mylne contains an account of the various attempts which have been made in the metropolis and its environs to obtain water from the sand strata, by means of wells and small bores, in which the water rises naturally to the surface. These attempts, and the raising the water by artificial means from the sand strata, have beeu for the most part unsuccessful. In some cases, parties having communication with the same sand stratum and contiguous to each other, were unable to obtain water at the same time, as the drawing water by one had the effect of destroying the supply of all the others. In other cases, the sand coming away with the water, large cavities were formed of such a nature as, after a short time, entirely to suspend the progress of the works. Of the latter difficulty, some remarkable instances occurred during the sinking of the well in the Hampstead road, which are particularly described in the communication. The supply of water from the sand being, from the causes just alluded to, very precarious, the New River company, in March, 1835, determined on sinking a well through the clay and sand into the chalk, for the purpose of ascertaining the supply of water from this source. The peculiar di-

fficulties experienced in the progress of this work, and the means by which these and similar difficulties are to be overcome, as set forth in the report of Mr. Simpson, appended to the communication, furnish a valuable compendium of information on this subject; and, being replete with practical details of an executed work of no ordinary difficulty, is one of those communications to which the council are most anxious to give every encouragement in their power.

The communication by Lieutenant Pollock on the Coffre dam now fixed round the 13 and 14-feet piers of Westminster bridge, and by Mr. Redman on the new stone bridge over the river Lea, at Stratford-le-Bow, are of a similar character with the preceding; they are both accurate acconnts, accompanied by valuable drawings, of important works actually executed. The collection of such records ought ever to be a primary object with the Institution, and their authors are most justly deserving of such marks of distinction as it is in the power of the Institution to bestow. The couccil would point out the above as instances of the facility with which individuals may contribute to their own advancement and repfitation, no less than to the objects which the Institution has in view; and would more particularly advert ;o Lieutenant Pollock, who, while in England, on leave of absence from India, oceupied himself in acquiring engineeriug knowledge, and with most praiseworthy dilligence, availed himself of the opportudities afforded him of observing and recording the progress of the works at Westminster bridge. Works of this natnre are accsssible to most of those who are studying for the profession, and by making use of the opportunities which are afforded them, they will be able to prepare communications most deserving of such distinctions as those which have just been conferred.

Among the other communications of the session, the council cannot, on on the present occasion, omit to notice those of your member, Mr. Parkes. His communication on the evaporation of water from steam boilers, for which a Telford medal in silver was awarded during the preceding session, and the interesting discussion to which it gave rise, are too well known to require further comment. But great as were the benefits conferred on practical science by the facts there recorded, they have been much surpassed by the subsequent labors of this author. In continuation of his subject, you received early in the session, the first part of a communication on steam bailers; and at the close of the session, the seeond part, treating of steam engines. Before Mr. Parkes was induced to turn his attention to the preparation of these communications, no attempt had been made to bring together, in one connected view, the various facts which had been ascertained. The economy of the Cornish system was indisputable; bst to what it was to be referred was involved in in some obscurity. It was reserved for this communication to call attention to certain quantities and relations which exerted a peculiar influence over the results; and which, being rightly ascertained, were at once indicative or exponential of the character of the boiler. If it be found that, in one class of boiler, the same quantity of coal is burnt eight times as rapidly as in another class—that the quantity consumed on each square foot of one grate is twenty-seven times that on the grate of another—that the quantity of water evaporrted bears some definite relation to the quadtity of heated surface—and that there is twelve times more evaporated by each foot of heated surface in one class of boiler than in another —and finally, that the quantity of water evaporated by a given weight of fuel is in one class double the quantity evaporated in another,—we have arrived at some definite relations whereby to compare boilers of different kinds with each other.

To these definite quantities and relations, the author with apparent proprie-

ty assigns the the terms "exponents;" and these being compared together for different boilers, their respective merits as evaporative vessels are readily perceived. Mr. Parkes has also called the attention of engineers to the effect of the element time, that is, the period of the detention of the heat about the boiler. The importance of attending to this cannot be too strongly insisted on; as it would appear from these statements, that boilers being compared with each other, in respect of their evaporative economy, are nearly inversely as the rate of combustion. Attention is also called to the fact, that there are actions tending to the destruction of the boiler, entirely independent of the temperature of the fire, and which may be designated by the term "intensity of caloric action." Of their nature we know nothing, but the durability of different boilers, under different systems of practice, affords some means of comparing the intensity of these actions.

Mr. Parkes having, in the first part of the subject, thus pointed out the distinctive features of the different classes of boilers as evaporative vessels, proceeds, in his subsequent and concluding communication, to consider the distribution and practical application of the steam in different classes of steam engines. And for this purpose, he is led to consider the best practical measure of the dymanic efficiency of steam—the methods employed to determine the power of engines—the measures of effect, the expenditure of power—the proportions of boilers to engines—the standard measure of duty—the constituent heat of steam—the locomotive engine—the blast and resistence occasioned by it—the momentum of the engine and train, as exhibiting the whole mechanical effort exerted by the steam—the relative expenpiture of power for a given effect, by fixed and locomotive non-condensing engines. This bare enumeration of the principal matters in the second communication, will give some, though a very inadequate, idea of the magnitude of the task undertaken by Mr. Parkes, for the communication is accompanied by elaborate acd extensive tables, exhibiting the results of the facts which he has collected and used in the course of his inquiry, and it may confidently be asserted, that a more laborious task has rarely bean undertaken or accomplished by any one individual than the series of communications thus brought before the Institution.

It will be one of the earliest duties of the succeeding council, to consider in what manner the sense of the great benefits conferred to this department of practical science, can most appropriately be testified.

The council also received, at the close of last session, from your member Mr. Lesslie, a most valuable communication on the docks and harbour of Dundee. This is one of the records on which the Institution sets the highest value, being the detailed account of an executed work of great extent. It is not, in its present form, well adapted for being laid before the meetings; but on its publication, which will take place vepy shortly, the Institution will have an opportunity of judging of the high value which it possesses.

In acknowledging, with gratitude, the numerous and valuable presents made to the Institution during the past year, the council would call the attention of the members generally, to the want still existing in the library of works of reference on general scientific subjects not immediately connected with engineering, and express a hope that such wants may be supplied by that liberality to which the Institution is already so deeply indebted. The collection of models, also requires many additions to render it as complete as the council could wish; and it is only by the wants of the Institution being constantly borne in mind by all who are interested in the subject, that such a collection can be formed as shall be worthy of the society.

Several societies have made an exchange of transactions with the Institution, and from the Royal Society of Edinburgh, the Philosophical Society

of Manchester, the Royal Irish Society, and the astronomical Society, sets of transactions, as complete as could be made up, have been received. The Master-General of the Ordnance, the Lord Lieutenant of Ireland, and Col. Colby, continue their liberal presents of the English and Irish surveys; and captain Beaufort and the secretary of the Admiralty have continued the presents of the series of admiralty charts. The Institution is also indebted to Mr. Vignolles for the busts of Locke and Dr. Hutton; to Mr. Field, V. P., for a bust of the late Henry Maudslay; and to Mr. Rivers, for that of Dr. Faraday.

The council would wish to take especial notice of the large collection of works of the late eminent philosopher, Dr. Young, now deposited in your libaary. For this great acquisition the institution is indebted to the kindness and liberality of his brother, Mr. Robert Young, who conceiving most justly that every thing connected with so great a benefactor to practical science, must be highly valued by this institution, has made it the depository of these books, from the library of his distinguished relative. The council, in thus publicly recording their sense of the kindness and liberality of Mr. Robert Young, would earnestly press upon others the importance of following so noble an example, and of presenting such works as are at their disposal, and of which the library of the Institution is particularly in need.

It was announced, through the medium of the last annual report, that the monument of Telford was nearly finished, and that a site had been selected in Westminster Abbey. The council have now the satisfaction of announcing, that the monument is fixed in the place destined for it, and they are confident that all who enjoyed the acquaintance, or knew the merrits of the late disntinguished President of this Institution, will rejoice that the memory of one so eminent and so highly deserving has met with so proper and just a tribute of respect; whilst all, no less than those by whose liberality the monument was erected, will feel that he has a name which will endure so long as there exists a record of the triumphs of the British engineer.—*London Journal of April and May* 1840.

PRACTICAL DEFICIENCIES OF SCIENTIFIC WORKS.

(From the "Adventures of the Missionary Williams.")

After some deliberation I determined to attempt to build a vessel; and, although I knew little of ship-building, and had scarcely any tools to work with, I succeeded, in about three months, in completing a vessel between 70 aad 80 tons burden, with no other assistance than that which the natives could render, who were wholly unacquainted with any mechanical art. I thought at first of getting the keel only at Rarotonga, and completing the vessel at Raiatea, but, as the king, chiefs, and people, urged me to build it at their island, promising me at the same time, every assistance in their power, I yielded to their wishes. As many friends have expressed a desire to know the means by which this great work was effected, I shall be rather more minute in detailing them than I should otherwise have been.

My first step was to make a pair of bellows; for it is well known that little can be done towards the building of a ship without a forge. We had but four goats upon the island, and one of these was giving a little milk, which was too valuable to be dispensed with; so that three only were killed, and with their skins, as a substanee for leather, I succeeded, after three or four day's labour, in making a pair of Smith's bellows. These, however, did not answer very well; indeed I found bellows-making to be a more difficult task than I had imagined, for I could not get the upper box to fill properly; in addition to which my bellows drew in the fire. I examined publications upon the mechanic arts, dictionaries, and encyclopædias, but

not one book in our possession gave directions sufficiently explicit for the construction of so common an article; and it appears to me a general deficiency in all the works I have seen on the useful arts, that they do not supply such simple instructions and explanations as would direct to the accomplishment of an important and useful object by means less complex than the machinery of civilized countries. When, for example, we were anxious to make sugar, and, for this purpose carefully read the article on sugar-boiling, in the most popular Encyclopædia in our possession=not having the apparatus therein described—we derived no practical benefit from it. If, in addition to a thorough and scientific description of the most perfect methods, there were appended plain and simple directions for manufacturing the article without the expensive machinery in common use, it would certainly be of immense service to persons situated as we, and emigrants to new colonies have been, These remarks are applicable to soap-boiling, salt-making, paper-manufacturing, and a variety of other processes of a similar nature.

Missionaries, and others leaving the country, when in search of information upon various important subjects, generally fail in their object, by seeking it where every thing is effected by complicated machinery, and all the improvements of the present age are found in perfection. It was so with us. We were taken to places of the above description—we gazed, we wondered, and were delighted, but obtained no practical information; for few imagine that there is any other way of effecting an object than that which they see. All persons going to uncivilized countries, especially missionaries, should seek that knowledge which may be easily applied, as they have to do every thing themselves, and in situations where they cannot obtain the means in general use elsewhere. It may, by some, be thought unwise to go back a hundred years, and employ the tedious processes then in use, rather than embrace the facilities which the experience of succeeding ages has afforded. But such an opinion, although specious, is unsound. Let the circumstances of the missionary, and the state of the people to whom he goes, be taken into the account, and it must be at once obvious, that the simplicity of the means used two or three hundred years ago, would better suit both his condition and theirs than the more complex improvements of modern times.

(From "Armstrong on Steam Boilers.")

ON BURNING SMOKE.

In nothing has the philosophical manufacturer or amateur mechanic been so much at variance with facts and the experience of practical men, as on the subjdct of *smoke burning*. It is perfectly true, that the black carbonaceous matter which usually escapes along with the incombustible gases, and which is the only *visible* constituent of what we term smoke, is all so much fuel, and when properly consumed under the boiler is undoubtedly a saving of coal: bu it unfortunalely happens, that the saving is such an inapplicably small quanjity, that none who have tried it have been able to calculate its amount, except in certain cases, when it has taken the so much dreaded negative form. It is far from my intentionto speak disrespectfully of any of those who have proposed to save fuel by burning smoke, for they have generally deceived themselves before they led others astray, as the hundreds of patents, as well as the hundreds of thousands of pounds that have been expended over them, amply testify; indeed they deserve no small share of our gratitude from the opportunities the subject has given of ascertaining by experiment, a great number of practical results which we can now make available in other more important improvements.

This suqject is introdnced here because it is closely allied to the one we have just been considering, namely, that of enlarging the furnaces of boilers; and I speak with the more confidence in this particular, from having had a good deal of practice in directing the application of several of the various methods of smoke burning which have been tried in this country, since the legislature made it in some measure compulsory. Several boilers are now working in this district, which have undergone various improvements under my directions, and with which I had undertaken to *save fuel*, and at the same time *burn the smoke*, and which were in almost every case successful; but mind, the fuel was not saved *by burning the smoke*, but by the adoption of various alterations and arrangements which the previous defective proportions or bad management of the particular boilers admitted.

Very few instances occurred where the attempt might be called a signal or total failure; and a failure in smoke burning is usually signal enough. There is a very common answer which enginemen are in the habit of giving to their employers when questioned as to why they allow so much smoke to fly away without burning it; it runs thus,—"Master, if you will only tell me how to catch it and bring it here, I'll be bound to burn it." Now, in the year 1829, a gentleman in a neighbouring town (Joseph Jones, Esq., Walshaw Mills, Oldham.) put the idea contained in this joke to the test of experiment, and it arose from the circnmstance of his having two steam engines, one situated at the foot of a hill and the other near the top, so that the smoke from the lower engine was carried through a tunnel or flue up the side of the hill, which in some measure answered the purpose of a chimney, and escaped by a shaft or stack near the higher engine. Consequently the situation admitted of great facility in arranging a plan for setting the question at rest, as to whether any saving was to be made out of burning the smoke or not; and as it was intended to be a sort of *experimentum crucis*, I willingly engaged to superintend the putting it of the upper engine, in order to admit of the whole or any portion into practice. Accordingly we had alterations made in the furnaces of the smoke from the lower one, without any obstruction to the draught of either. Proper valves and dampers were fixed for the purpose of admitting and regulating any required portion of atmospheric air, in order to supply the neeessary quantity of oxygen to the new combustible And, in fact, from 30*l.* to 40*l.* was expended in apparatus, so that nothing should be omitted which had any chance of securing the success of the experiment; but it was all of no avail, and the result was as already stated. The smoke to be sure might be sad to be *burnt*, for it passsd through a very hot furnace, but it certainly was not *consumed* as usually understood, for it always appeared to me to be much blacker at the chimney top after having passed through the furnace, than it did when it was allowed to pass off without going near the fire at all And as to the saving of fuel by the process it may safely be pronounced *nil*, for unfortunately we were never able to raise sufficient steam with it to keep the engine going for a quarter of an hour together.

The circumstances attending the above experiment are stated, because we believe it to be the first of a series of attempts to consume smoke by combustion, according to a principle lately revived by numerous patentees and experimenters in this neighbourhood, although originally suggested and patented by the late Mr. Watt, in 1785. The great secret of smoke burning, however, is now pretty well known to practical smoke burners. and that is, either to make very little (*or none*), to burn, or otherwise so to dispose of the fuel in the furnace, that smoke of such a quality only is made, as will burn comparatively easily; and in either process the saving in fuel is a point yet unsettled.

In the first case, by keeping a thin fire, and throwing on the coal by a very small quantity at a time, which is most advantageously done by the firing machine. and with a free access of air through the grate, we are assured that no *combustible* gases escape from the furnace; consequently the very small quantity of solid carbon held in suspension (principally by the extricated azote and other *incombustible* gasses) is the only portion of the smoke capable of combustion, and to effect which, a most intense heat with a rapid supply of oxygen is necessary, and in a much greater degree than the ordinary economy of a steam boiler requires.

In the other case mentioned, in order to produce smoke that will burn more easily, it is requisite that a large quantity of coal be laid on at a time, and also to have a slow draught, so that nearly the whole of the carbon evolved is combined in the production of carburetted hydrogen gas. In fact, the furnace with a thick fire, may be likened to a gas retort, and the carburetted hydrogen thus distilled forms an explosive compound when mixed with a fresh supply of atmospheric air at the bridge of the furnace. This last is on the principle of Mr. Parkes, whose system of smoke burning came so much into favour some years ago, but which is now nearly extinct, although it is yet a point much debated, whether a thick fire with a slow draught, or a thin fire with a quick one, and its necessary accompaniments, a firing machine, and a good chimney, is the most economical.

The very general adoption by the Lancashire manufacturers, of Stanley's firing machine, and Walmsley's moving fire bars, would seem to be decisive of their general economy in preference to any system of firing and stoking by hand; but there are other causes for this preference, quite independent of the question of economy of fuel, some of which have had great influence in the general disuse of Mr. Parke's system of firing; one of which is, that in the latter system, the boilers are required to be considerally larger for the same power, a fatal objection here, but which is more or less applicable to every system of smoke consuming that we are acquainted with. The force of this objection, will be felt at once by those who are acquainted with the practice of the great majority of the Lancashire cotton spinners, which is that of using their steam engines, as some people do post horses, by making them do as much work as ever they can, short of breaking down. The same remark is also applicable in some degree to the Liverpool steam vessels; they are made to go at their utmost speed, in order that as much work may be got out of them as possible, and in as short a time; although, owing to their being generally the property of Joint Stock Companies, they have, as in the case of most monopolies, not as yet been sufficiently subjected to the stimulus of competition and individual enterprise.

The general facts above mentioned are so well known to every experienced fireman and operative engineer, that the saying has almost passed into a proverb with them, absurd as the connection may appear, that, "*it requires plenty of boiler room to burn smoke;*" and we know that many of them consider it as easy to drive a 30 horse engine with a 20 horse boiler, if fired upon Stanley's plan; as it is to drive a 20 horse engine with a 30 horse boiler, upon the principle of Parkes. The observations of this class of men are frequently more worthy of regard than inventors of new plans are generally disposed to pay to them. More especially if we consider that this "instinct of ignorance," as it has been called, enables them to manage all the various complicated arrangements of the fires, engines, and boilers of that wonder of the present age, the "Ocean Steamer," in a manner that we are afraid will not be much improved upon, for a few years to come, by all the engineering classes of our new universities. At any rate, if a little more attention is paid in future to th is "instinct," or tact," by some of the marine ma-

nagers and other supernumeraries of more than one or two of our extensive steam navigation companies, we may be spared the mortification of hearing of such unfortunate attempts in *smoke burning*, as that which is said to have caused the untoward return of the "Liverpool" steamer to Cork, when on her first voyage out to America.

Soon after the unsuccessful experiment of Mr. Jones, already detailed, loom, &c., made an ingenious attempt to bring Mr. Watt's principle Mr. Horrocks of Stockport, the well known improver of the power to bear, and although only partially successful, it forms one great step towards its ultimate accomplishment. Instead of taking the smoke of one fire over the top of another, he caused it to return over the same fire from which it was evolved. This he contrived by means of a most ingenious adaptation of the centrifugal fan, or rotatory blowing apparatus. It was worked by the engine at the rate of about 1,500 revolutions per minute, and so arranged that the smoke was drawn from the flue at the further end of the boiler, to the front, whence it was propelled down upon the hottest part of the fire, where its combustion was effected, although imperfectly.

About the same time that Mr. Horrocks was carrying on these experiments, fans were used by Messrs. Braithwaite and Erison, and others, both for locomotive engines and steam boats. Fans have been also applied by many, both before and since that period, for the purpose of obtaining an artificial blast or draught for the furnaces of steam engines, according as the propelling or exhausting power of the fan employed, but we believe none of them ever employed it for the purpose of returning the smoke into the furnace again. To Mr. Horrocks, perhaps, is also due the merrit of first employing both the exhausting and propelling action of the rotatory fan at the same time and in the same process, this double action being carried on in a furnace almost entirely inclosed from the external air.

The next attempt to follow up this principle of burning smoke, has been very recently made by Mr. David Cheetham, Jun., of Stayley bridge; but as at the time of writing this, the specification of his patent has not yet been published, a brief notice of it will suffice here.

As in the Stockport experiments, Mr. Cheetham also employs a fan, and nearly in the same manner; but instead of passing the smoke over the top of the fire, as was done by Mr. Horrocks, and also by Mr. Jones, of Oldham, as before stated, he sends it into the ash-pit, (which is inclosed,) whence it is by the joint propelling and exhausting action of the fan forced to pass through the fire-grate itself; by which means the flame and hot air in the furnace is propelled with great velocity directly up against the boiler bottom, a circumstance which sufficiently accounts for a considerable portion of the economy of the proeess.

But there is also another peculiarity which distinguished this invention from that of Mr. Horrocks, which is, that the small quantity of atmospheric air necessary to supply oxygen to the furnace, is admitted to the fan by an adjustable aperture, and allowed to become heated by intermixture with the smoke and hot air, as they are returned to the ash-pit. Thus the process acquires many of the well-known advantages belonging to the hot-air blast, as used in metallurgic operations. The saving in fuel is stated by the patentee to be about 20 to 30 per cent, and we have had opportunities of ascertaining, that in some cases the statement is not overrated; but how much of this saving is to be ascribed to the improved draught, and the peculiar application of the hot air blast, or whether any portion of it is derived from the the actual combustion of the smoke, there have as yet been no direct experiments to prove.

In the course of our practice in saving and fuel burning smoke

we always found that nothing tended so much to the accomplishment of both these objects as enlarging the furnace and flame bed, and where the draught of the chimney was good, also enlarging the fire-grate. In adopting this last alteration, it was always found that the maximum effect was produced when the area of the fire-grate was increased in a somewhat greater ratio than the effective heating surface was diminished:—that is, when a certain effect is to be produced, say, for example, an evaporating power equal to the supply of a twenty horse engine, which, we have seen, requires twenty square yards of effective heating surface, but from malconstruction of the boiler or other circumstances we have only eighteen yards, then the furnace will require to have a fire-grate of a *little more* than twenty-two square feet in an area; or if the heating surface be only sixteen yards, then the fire-grate will be required to be *more than twenty-four*, in fact about twenty-five square feet.

NOTE.—We happen to have met in our own experience with a confirmation of the above, and have frequently adverted to it, as a useful hint in "smoke burning," and "spark catching." Moreover, we consider it the more valuable because it shows that many, if not most, of those who have attempted to accomplish that object, having gone "right the wrong way," to work. Besides it is one of those cases where any thing else than a correct "theoretical" knowledge of the subject can afford no sound basis for "practical" operations.

In the summer of 1836, by the politeness of the directors of the Utica and Schenectady railroad, we were invited to be present at the opening of the road. On our return from Utica, wishing to avail ourselves of the opportunity of a remarkably fine day, we took our seat on the top of the cars, to enjoy the pleasure of a moving panorama of the beautiful valley of the Mohawk.

The engines were new, the wood not of the best kind, and the engineman labored, of course, under the disadvantage of an unaccustomed route. Huge volumes of smoke rolled from the chimney, and a stream of fire in the shape of sparks or rather flake of ignited coal, flew around and rather diminished the pleasure of our outside seat. Presently the conductor came to us and observed, that on account of the difficulty of making steam it would be necessary to remove the wire gauze chimney cap, and that it would no longer be safe to remain outside, on account of smoke and sparks. We remarked, the remedy for a bad draught should also be one for sparks and smoke; and as it it would not be worse than it then was, we should prefer to remain. Of course leaving us to be burned up at our pleasure, we had a chance to ascertain the effect. The cap was removed, and after the first rush, *the smoke became far less in quantity, and the sparks diminished in number and size*,—it was actually more comfortable than before. It was apparent, that a more perfect draught had consumed the fuel to little advantage.

In the case alluded to by Armstrong, instead of pure air, a quantity of cold and incombustible matter (under the circumstances) was thrown through the furnace. We say cold and incombustible because without a

far higher heat and an abundant supply of air (neither of them attainable by the means described), the smoke introduced really was so.—[Ed. R. R. J.]

NOTE BY THE AUTHOR.

Since this article was printed, it has been ascertained that at least one half of the saving to be derived from the use of Mr. Cheetham's patent smoke burner, arises from the circumstance of keeping the ash-pit constantly closed up, thereby preventing any indraught of cold air through the flues during the night or at any other times when the engine is not working. This is a most important part of the economy of the process, and is called by some gentlemen of Stayley bridge connected with the patent, "*bottling up the heat.*" Of course this part of the invention can easily he used at all times when the engine stops, independently of that for the combustion of smoke, and it has now been so used in several instauces. I have been informed by a manufacturer, (John Leech, Esq., of Staleybridge,) who has proved it experimentally on a large scale, that the saving to be effected by this part of the invention, is about 12 per cent. Nothing can be more satisfactory than the mode in which this gentleman conducted his experiments. His plan was to work his boilers a whole week from Monday morning to Saturday night with the apparatus attached to all of them, (13 or 14,) and the succeeding week without the apparatus, and so on alternately for a great number of weeks, noting the consumption of fuel at the end of each. The correctness of these experiments was sufficiently proved by the fact of the saving remaining constantly the same, or at least not varying more than one per cent, on each side of the average of 12½.

The specification of the above patent may be seen in Newton's London Journal of Arts, Sciences, &c., for April 1839. As a *bona fide smoke burner*, it may be stated to have been, when carefully applied, more generally successful than any other that has been introduced in the manufacturing districts. I intend investigating the merrits of this and other plans for consuming smoke, in my forthcoming work on Chimneys and Furnaces.

The practice of closing up the ash-pits of steam engine furnaces, except a very small portion at the upper part nearly close under the front of the fire grate, is very common, and I have long recommended it as the best means of ensuring the fuel to be consumed on the front of the grates quick. ly as at the back, thereby keeping the fire of a uniform thickness; but to effeet this object in the best manner, the opening is required to be of the full width of the fire grate, so as to allow a thin stratum of air to pass nearly horizontally to the under side of the fire bars, and then, by properly adjusting the height and the area of this opening, the air can be caused to impinge nearly uniformly on all parts of the grate.

It is very easy to use this opening to the ash-pit as a regulator for the fire instead of the damper, but I consider that it is highly objectionable to do so, although it is recommended by Tredgold and other authors, besides having been recently put into practice in some of the atlantic steamers. One of my reasons against using the opening in this way, is, that there can be only *one* position of it, which is the best for the particular furnace and system of firing it is used with,—this, when once found, of course necessarily excludes any alteration without liability to injury. Besides the *quantity* of air admitted can be quite as easily regulated by the damper in the chimney flue. The damper, in fact, ought to be confined exclusively to the purpose of only regulating the quantity of air admitted, so as to suit the varying demands of the engine for steam; while the ash pit regulator is used for giving a proper direction to the current of air, and also to shut the latter off entirely.

When the ash pit regulator consists of an aperture and sliding plate of six or eight inches square in the centre of the front of the ash pit, it is then perhaps of the worst possible kind, as it causes the air to act on the centre of the fire like the concentrated blast of a blow pipe or bellows, and most destructively on some particular portions of the boiler, which as well as the grate bars becomes very speedily burnt out. This effect, however, is not so liable to be produced in the case of factory boilers, or those which are fired by machines and have moveable bars, as it is in that of locomotive and marine boilers. The latter are more especially liable to become burnt out in this way owing to the usual system of firing pursued in steam vessels, and which is very properly called *charging* the fires,—the operation being in fact more like that of charging a retort for making gas than any thing else.

It is unnecessary to repeat here opinions expressed in the body of the work in favor of thin fires and quick combustion for land boilers, as it may be said to be a point yet open to discussion; the system of *slow* combustiou having lately received a talented advocate in the author of a paper read before the Institution of Civil Engineers last winter. But respecting the applicability of slow combustion to steam navigation, it is impossible that there can be two opinions amongst engineers. *A thin fire and a quick draught* are the great essential points to be attended to in steam packet boilers, and will always be synonymous with plenty of steam and a quick passage.

Mr. Josiah Parkes, who is the great propagator of the principles of slow combustion, admits that it requires about seven times the area of heating surface to produce the same evaporative effect by it as by the ordinary practice; a sufficient disqualification against its adoption in steam packets. It has been sufficiently proved, that, with the common Lancashire coal, a greater area of properly disposed effective heating surface than a square yard to each horse power is not advisable as a means of economy at the ordinary prices of materials and cost of management, in the case of land boilers in the cotton manufacturing district, or, in other words, any saving that would arise from an extension of the heating surface of a boiler beyond this limit, would be overbalanced by the ordinary interest for the outlay of capital and other contingent expenses in obtaining it. Hence, how outrageously absurd it is to expect to derive any great increase of profit from the adoption of the system of slow combustion in steam vessels, when we consider that not only are the boilers of the latter (from the necessities of construction) about double the weight and three times the cost of land boilers of equal power, but there is also to be reckoned the cost of carrying them, or the displacement of so much valuable cargo, although there is a set off against this to a certain extent, on the account of the expense of carrying the extra coal or rather *half the coal* that would be saved by the enlargement of the boiler. This, however, is a matter of the simplest possible commerctal calculation; for example:—if by doubling the size and weight of a steam packet boiler a saving in fuel can be effected of *five per cent.*, (a supposition which I by no means admit as probable,) and supposing the fuel to be consumed gradually from the commencement to the termination of the trip, then the proper deduction on this account for lightening the load of the vessel will be *two and a half per cent*, while, on the other hand, what is saved in boiler room must be reckoned at its full amount as permanent available profit.—If calculated in the same manner, I have no doubt but that the much vaunted saving by working marine engines expansively will be found to be very small indeed, unless the steam is raised to so high a pressure as to become dangerous. Raising

the steam to a dangerous pressure in the boiler merely for the purpose of expanding it again in the cylinder at a greatly reduced power,—as well as the system of slow combustion and wire-drawing the smoke through long winding flues in order to save a modicum of coals, are at best but philosophical niceties that are quite out of place in an Atlantic passenger steam ship in the present early stage of steam navigation. In short, wire-drawing the steam and wire-drawing the smoke, are in this case equally dangerous and useless, and the sooner steam packet proprietors dismiss them and attend more to a radical reform in the construction of their boilers, the quality of their coal, and the management of their fires, and, above all, to some more efficient means of propulsion than the present lumbering paddle wheel, the sooner they will accelerate the passage from Europe to America.

A slight consideration of the above principles, and a proper application of the rules contained in this work, will prevent any one getting so far wrong as some few influential parties connected with the commercial steam marine of this country have unfortunately had the means of doing; I say unfortunately, because extensive loss of life has already taken place, and must inevitably occur in future, in an increasing degree with the rapidly increasing number of steam ships for long voyages, unless the managers and engineers concerned unite a sound practical knowledge of the subject with a willingness to learn more from whatever source it may be offered, rather than the flippant parade of pseudo scientific acquirements that is sometimes to be met with, and which on application to new circumstances is always found to be miserably inefficient for any thing but failure.

The above sentiments are far from being meant to reflect invidiously upon any particular steam packet company, but, to a certain extent, they admit of a general application, and in excuse for saying this, I need hardly state that the subject is one of great public concern where the lives of thousands of passengers are daily intrusted to the care of hands wielding such an unseen and tremendous power as that of steam. With respect to the misapplication of capital and waste of property involved in the mismanagement of marine boilers, it may seem not a proper subject for animadversion, as the owners must in time "find it out," and some of them have commenced finding it out very speedily. As an illustration of this expensive way of trying experiments, it will be quite sufficient to mention the "Liverpool," which was the first steamer from Liverpool to New York belonging to the Transatlantic Steam Ship Company. In this vessel it was determined to try the celebrated Cornish principle of *slow* combustion, in order to burn the smoke, on her first voyage; this was effected by a misapplication of Mr. Parkes's principle, namely, *by allowing a constant stream of cold atmospheric air to pass into the flues of the boiler through a large aperture opening from the ash pit to behind the bridge of each furnace*; which aperture was *without a valve* or any other means of closing it at the discretion of the engineer. The consequence was, that although the engines, &c., were in every respect excellent, as well as the vessel itself, the latter after proceeding nearly half way across the Atlantic was compelled to return to Cork, where, of course, the patent smoke burning holes were stopped up before she proceeded again to her destination.

The Havana Railroad, a work of 45 miles in length, connecting that city with Guines, on the south side of the island, is doing a profitable business. The receipts for travel and transportation in seven months were $225,191—yielding a clear profit of fifteen per cent.

We are happy in being able to announce to our readers, that we have completed an arrangement with Mr. L. Klein, the accomplished assistant of the late Chev-de-Gerstner, whereby Mr. K. is to become a regular contributor to the pages of the American Railroad Journal.

When it is recollected that Mr. K. has been the constant companion of the late Chev-de-Gerstner, and has at present possession of his papers—we hope that in securing the services of Mr. K., we convince our readers of our disposition to spare no pains to render the Journal moreand more valuable.

ERATTA.—On our first page the name of "M. Daguerre," is uniformly mispelt, "Daguenis."

ADVANTAGES OF IRON COMPARED WITH WOOD STEAMERS.

1. The first cost of an iron vessel is from fifteen to twenty per cent. less than a wood vessel.

2. The capacity of an iron vessel is much greater than that of a wood vessel of the same dimensions, in consequence of the less space occupied by the material; an iron vessel of four hundred and thirty tons would present about the same internal surface as a vessel of five hundred tons built of wood.

3. The weight of an iron vessel is not more than two-thirds of that of a wood vessel of corresponding tonnage; hence the displacement of the iron vessel is much less; therefore the diminished power of her engines, and comparative quantity of fuel required, makes the combined displacement very much in favor of the iron seamer.

4. An iron steamer is of much greater durability, without the repairs rendered necessary by the common wear and tear of wood steamers. It was stated before the House of Commons, that an iron vessel had been worked for thirty-six years, and that an iron steamer had been constantly employed for sixteen years, and at the expiration of that time her bottom was examined and found free from oxidation, the outer scales and rust had disappeared, leaving the bottom perfectly smooth and clean. Now a wood vessel during that time would have required her coppor to have been four times renewed, as often recalked, paid and painted, besides frequent and small repairs in replacing defective wood, and at the expiration of that time either condemned or thoroughly repaired, aud if we add the value of the time required to effect such repairs, the economy of using iron steamers will be enormous.

5. Perfect safety from fire is another of the great advantages to be realized by adopting iron steamers. The returns of steam vessels lost in one way or another, demontsrate that *a great proportion of these lossss have arisen from fire.* It naturally follows that the premium for insurance would be much less for iron vessels than wood. The present custom is the use of wood beams and deck, but were it necessary for still further security, iron might be substituted with equal ease for both.

6. The danger of the vessel's sinking by springing a leak, if not entirely obviated, is very much lessened. The facility of dividing an iron vessel's hold into departments by iron bulk heads, which can be made as tight and as strong as a boiler, is very obvious; therefore if a leak takes place in any one division, that division may be filled as high as the outer surface of the water, and the vessel be still comparatively secure. Moreover, a leak at

sea, on board an iron vessel, may be much more easily discovered than it could possibly be on board wood vessels, as it would not be hidden by a mass of timber. Another advantage would be a perfect freedom from the smell of the engine-room, which could not reach the cabins, and an entire absence of bilge water, so offensive on board all wood vessels. The plan of dividing the hold of wood vessels by means of partitions, will doubtless answer some good purpose, but where so intense a heat exists as in the interior of of a steamer, the wood must and will draw; this, added to the working of a wood vessel, would render it absolutely impossible to make the bulk-heads tight.

7. The kanger from lightning is very much diminished, as the whole body of the vessel is a conductor of electricity. Lardner's voyage to Africa in an iron stermer, coroborates this fact, and I find the opinions of the most scientific men concur on this subject. The captian of a steam vessel, who commanded a steamer on the Mississippi more than twenty years, told me that he never knew a steamer to be struck with lightning when her engine was at work.

8. In tropical climates there is a great advantage in iron steamers, as the internal temperature of the hold would be very much cooled by the surrounding water, which would gradually add to the health and comfort of those on board. This result was also experienced on board the iron steamer already referred to, which went to Africa. Another advantage which will be fully appreciated by those accustomed to voyages in tropical climates, is the entire freedom from insects and other animals which overrun wooden vessels, forming in frequent instances a perfect barrier to all comfort.

9. Iron steamers are less exposed to accidents than wood steamers; if the latter, for instance touches the ground but slightly and only to rub her copper, which is often the case, it is absolutely indispensable in tropical climates, to have it immediately replaced, or otherwise a few weeks will be sufficient for the worms to destroy that part of the bottom so exposed. The expense attendant even on such slight repairs, particularly in the absence of docks, would be immense. In an iron vessel, under the same circumstances, no difficulty would arise. Again, an iron vessel in striking a rock, would very likely suffer an indentation in her bottom, but it would not pass through the iron, when a wood plank, under similar circumstances, would, in all probability, be broken and rent. An iron vessel has been thrown on a ledge of rocks, and after beating on it for some time, was saved; it was found that the bottom was greatly bruised and indented, but still perfectly tight, and it was admitted by the spectators that a common wood vessel under similar circumstances, would certainly have bilged and gone to pieces. The iron bottom presents a perfectly smooth surface, the heads of the rivets forming a plane with the plates.

10. It is, I believe, an understood principle, that superior buoyancy makes a superior sea boat, and its application is strong proof in favor of iron vessels for steam purposes. We have the united testimony of many persons who have witnessed the operation of iron steamers in heavy weather, as to their great safety and security. It has been argued by some that this very buoyancy rendered them unfit for high sea use. This argument naturally carries one back to about twenty-five years since, when it was considered indispensable, that a vessel of three hundred tons should draw seventeen or eighteen feet of water, to enable her to hold a good wind and make her safe in a sea way. At present the American packet ships of seven to eight hundred tons, seldom draw, when in their best trim, more than thirteen feet of water.

11. It has been urged against iron steamers, that they are subject to extensive vibration by the action of the machinery. I was recently on board the Rainbow, (an iron steamboat of one hundred and ninety-eight feet length, twenty-five feet beam, and nearly of six hundred tons,) on an experimental trip from Blackwall to Gravesend and back. We had the full benefit of the tide down, and accomplished the distance in seventy-one and a half minutes, and allowing for a tide of three and a half miles per hour, we made fifteen and a half miles per hour through the water, working at a pressure of less than four pounds, with two ninety horse engines. The very slight vibration was a subject of general remark.

12. Another argument against iron steamers, is the difficulty of making them stiff. It seems very absurd to say that an iron form cannot be rendered equally stiff and firm as one of wood. An iron steamer is less likely to bend or hog than a wood steamer. The pressure is on the edge downwards, and it would be scarcely possible to produce suchan effect, unless the iron be broken, for the rivetted part may be considered equally strong as, or even stronger than the plate.

13. The construction of iron vessels can be rendered perfect only bypractice, time, and experience. The drafts or models which I have seen, admit of many improvements, but as to their eventual general adoption, we have no question. To many it appears such an innovatiou upon custom so long established, that it is condemned without cause or reason. I am perfectly persuaded that iron steam vessels can be navigated for one half the expense incurred at present in wood vessels. The opinions of the most practical and scientific men in the kingdom are universally in favor of iron as a substitute for wood in the building of steamers, both on account of its greater security, and durability, and also of its extraordinary economy.

Since the foregoing was written, I have received a report from the Seine respecting the iron steamer Aaron Mour—that she was in capital condition, very fast, and performed the voyages to the satisfaction of the proprietors; she was built in the year 1817, has run twenty-one years, and no signs of corrosion.*—*Boston Daily Advertiser and Patriot*

London, 18*th Oct.*, 1839.

SIR JAMES ANDERSON'S BOILER.

Since the invention of locomotive carriages, it has been a *desideratum* to get engines which would run along common roads, and many attempts have been made to remove the difficulty, but without success, until the recent triumph of Sir James Anderson. It has been proved by engineers that the difficulty of drawing carriages along a common road, is ten times greater than along a railroad; in other words, that the resistance is ten times greater; and a power that would drag a load of 100 tons on the railroad, could carry only 10 tons on the ordinary road. The great obstacle was to overcome this very disproportionate resistance. The world has been so long deceived by the promises of steam vehicles which could run upon common roads, that a conviction is raised of the impossibility of the attempt succeeding; but Sir James Anderson demonstrates the practicability of the undertaking, by an invention upon which he has bsen engaged for fourteen years, and which he now introduces to the public notice. This boiler resembles, externally, the figurs of a house, viewing it at its gable; the sides and roof composed of plates or chambers of water, two inches

* Drawn up by Wm. Wheelright, Esq. now engaged in introducing steam navigation from England to Chili, across the isthmus by railroad.

thick; internally, of a succession of plates same thickness, placed like partitions in a house, every partition fitting home closely to the roof, and communicating by tubes to the steam reservior at top; alternate partitions (or water plates) fitting closely to the floor or bottom of the boiler, and communicating by tubes to the general supply, or horizontal tube for admission of water; thus giving free ingress for water at bottom, and free egress for steam at top; while the fire, being placed in a space at one end, and the funnel at the opposite, a continuous flue is formed, ascending and descending alternately, until tne heat is robbed almost to its last degree, before being permitted to escape. The construction of each plate or water chamber is thus described: "They are composed of sheet iron, flat, vertical bars, two inches thick, being interposed between, at three inches asunder; and at every three inches a rivet passed through the bar and sheet; thus, over the whole surface the strongest rivets hold the sheets together at each three inches, giving a strenghth more than sufficient to resist any possible pressure from within; and the bars placed between, making it impossible (even should all the water have left the boiler, and a vacum be thus created) that it could collapse." From the resistence offered to carriages on common roads, the points to be attained in locomotive carriages for such roads, are increased strength, a size not incompatible with speed; the rapid developement of steam, and also economy of fuel. In the first place strength is obtained in the boiler now under consideration, by means of flat chambers, which possess strength, and which still fit in a boiler of a size consistent with speed. These flat chambers are each three inches long, connected with cross bars, and fixed with rivets at every three inches. They are placed in every part of the boiler, and occupy a space six feet high, six feet long, and three feet broad.

A boiler of this kind was, we understand, completed about 15 months back, and has continued to work every day since most successfully, without producing a leak or the slightest derangement; and this, notwithstanding the steam, has frequently been raised to upwards of 500 lbs. pressure upon each square inch of surface. Now the boiler contains 360 feet of working surface, which, multiplied by 144, gives 51,840 inches, and this multiplied by 500 lbs. gives the enormous pressure of 25,920,000 lbs. upon the whole boiler! A compact machine like this, which is capable of generating, sustaining, and applying so enormous a force, affords, we think, a pretty good test of the excellence of the workmanship, as well as of the principle of its construction. It is very satisfactory to have a boiler capable of resisting such a pressure; but one-tenth of it is fully adequate to all the requisites of actual practice. Then as to the rapid developement of steam—as this is made to take place from the plates being only two inches asunder, an immense quantity of steam can be produced almost instantaneously. The fire is kept up by means of a fanner worked by machinery. The air-tubes are enclosed in a cylinder of water, which water instantly condenses the waste steam, and a portion of the heat is carried on by the current of air into the fire; and at the same time, by the instantaneous condensation of the steam, all noise is absolutely removed. The incrustation that has hitherto been so fatal to bollers, is totally prevented in Sir Jame's, by the unequal heating of the water in the chambers, which causes a constant circulation of the fluid. And again: in other boilers consisting of tubes, the joints and solder are exposed to the action of the fire. In that under consideration, there is riveting without soldering, and the joints are preserved from the action of the fire by the interposition of a floor of iron. It is said that four-pense a mile will pay the cost of fuel, an expense trifling in the extreme.

Thus far we have described the construction, strength and capability of the invention; but there is one little point, without which, we might say, the whole were useless. This consists in placing perforated cones of fine wire over the orifices which admit the steam into the reservoir. At first the orifices were used without the cones, and the consequence was, that from the fact of every chamber being filled with water to the top, and coming thus within a few inches of the reservoir, the ebulition of boiling, caused a quantity of aqueous matter to be forced with the steam into the cylinders, and the engine became clogged. The difficulty was for a length of time insurmountable; but great as it was, the inventor's perseverance was greater. Reflection suggested a remedy in the application of the cones: they were adapted to the boiler, where for a period of more than eighteen months they have performed their work, untouched and uninjured, nor has the boiler all that time cost, one shilling for repairs, or been one day idle.

In consequence of having such an enormous power in the boiler as 25,920,000 lbs. pressure, the talented inventor was enabled to overcome the difficulty of ascending hills with a locomotive, in the following manner: Instead of acting directly on the axle to which the propelling wheel is attached, another wheel is set in motion, on which are a large and a small toothed wheel, the same being on the working axle: when the carriage is moving on a level, the large wheel having 24 teeth, acts on the smaller having only six; consequently one revolution of the larger wheel willproduce four revolutions of the propelling axle: here power is dispensed with to increase velocity; but when the engineman approaches a hill, he can shift the steam axle, so as to bring its small toothed wheel into contact with the large toothed wheel of the propelling axle. Here the case is instantly reversed; velocity is sacrificed to acquire power; and thus Sir James Anderson has surmounted what has been previously deemed impracticable.—*Manchester Guardian.*

EXTRACT FROM A NOTICE OF THE NEW YORK GEOLOGICAL REPORT, IN THE AMERICAN REPERTORY.

"Accompanying Dr. E.'s report is a very valuable communication of about twenty pages, from Professor Farrand N. Benedict, of the University of Vermont, giving an account of the measurements of the mountains in the northern section of the state, and some just observations as to the relative value of barometrical and trigonometrical measurements in general. According to Professor B. Mount Marcy is 5537 feet above tide water, instead of 5467, as obtained by Mr. Redfield in 1838. In relation to the comparative merrits of barometrical and angular measurements of great elevations, Prof. B. remarks as follows:

"The barometer and theodolite have their peculiar capabilities and defects; and the exact measurement with either, of a mountain covered with clouds during the greatest portion of the year, and surrounded by an atmosphere subject to incessant change, demands more perfect instruments and skill in their use than is generally apprehended.

"The chief difficulty that the barometer has to contend with, and one over which it has no direct control, is a want of uniformity in the changes of atmospheric pressure, in different places at corresponding times. As correct observations have been multiplied, more harmony in this respect has been detected than had formerly been supposed. Indeed this is not the only department in which nature has been held accountable for blunders due to clumsy instruments and unskilful observers. This difficulty, without doubt, exists to such an extent as to impair confidence in single sets of

observations at least, with whatever care they may have been made. The atmosphere, whether charged uniformly with vapor or not, must evidently have a strong tendency to equilibrium; and a derangement of it, within moderate distances, must consequently be transient. For this reason, a course of consecutive observations at the same station should always be taken, which will enable the observer to guard against error, either by rejecting all, or selecting those that in this way are shown to be worthy of confidence.

"The corrections for the hygrometrical state of the atmosphere are undoubtedly more or less imperfect, although that portion of the error which yet remains unprovided for, I apprehend, is comparatively inconsiderable. La Place measures these effects by the temperature of the air, and observes that this hypothesis very nearly satisfies the observations that have hitherto been made. The agreement of my results, where *courses* of observations were taken, intimates with what degree of approximation I have corrected for the changes of the weather. This agreement is particularly worthy of remark in relation to Long Lake, where the observations were protracted in time, and the weather singularly variable. But notwithstanding all this, I am free to admit that these corrections are still less perfect than could be desired.

"The theodolite is above the need of eulogium from any one; but, like every other human invention, it has its proper capabilities and defects. An indispensable condition to the accuracy of angular measurements is the exact determination of a base line—a work which requires that skill, variety of delicate instruments, time, and means, which in this country are not at the command of a single individual. Triangulations, embracing great extent, have been executed with astonishing precision, and the results of similar measurements, properly conducted, are entitled to the utmost confidence; on the contrary, the angular determinations of high mountains have been comparatively vague. One cause of this difference consists in the great distances at which mountains are generally observed, and the consequent smallness of the angles of elevation. In this respect a condition is almost necessarily violated, which was scrupulonsly satisfied in the surveys just referred to.

"The chief source of error in mountain measurements, and one which distinguishes it from horizontal ones, is refraction. This difficulty, growing out of the condition of the air, and independent therefore of the instrument, is analogous to the one which the barometrical method is exposed to, with this difference in favor of the latter, that the atmospheric changes going on at both stations may be detected and compared.

"Refraction differs, in different countries, and at different times, from $\frac{1}{14}$ to $\frac{1}{4}$th of the distance, reckoned in minutes. Such being the uncertainty as to the true path of light in low and familiar regions, it must be particularly difficult to follow it with precision through mediums of changing relations, and elevated tracts comparatively unknown. Refraction, too, depends not only upon the affections of the air, but upon the relations of the line of sight with other objects. Every one who has used the spirit-level, is aware of the errors that he is exposed to, when, in clear weather, his line of collimation approaches logs and fences on the surface of the ground."

To illustrate the uncertainty of the measurements of mountain elevations, Prof. B. refers to the peak of Teneriffe as an example, the height of which varies, according to geometrical measurements made by different observers, from 1700 to 2600 toises; and by barometrical observations, from 1900 to 2025 toises: thus showing that results obtained by geometrical operations, differ more from each other than those found by the barometer. It would, however, be wrong to cite this want of harmony as a proof of the uncertainty

of all measurements of mountains; for, as Humboldt in his Personal Narrative well observes, "Angles, the value of which is determined by imperfect graphometers; bases that have not been levelled, or the length of which has been determined by the log; triangles that give an excessively acute angle at the summit of the mountain; heights of the barometer, without any notice taken of the temperature of the air and of the mercury; unquestionably are not means calculated to lead to accurate results."

Prof. B. suggests a connection of the Saranac river which empties into Lake Champlain at Plattsburgh, with Racket river, which empties into the St. Lawreuce, near St Regis. From his calculations, it appears that by excavations equal in the aggregate to 6½ miles, and an amount of 240 feet lockage, continuous lines of batteaux navigation through, and connecting these two rivers, may be formed, equal in extent to 210 miles; and that this would be increased to more than three hundred, if we take into consideration the coasts of the lakes.

THE ELECTRO MAGNETIC TELEGRAPH OF THE GREAT WESTERN RAILWAY.

This telegraph, which is the useful and scientific inventifin of Mr. Cooke and Professor Whitestone, of King's college, has been, during two months, constantly worked at the passing of every train between Drayton, Hanwell, and Paddington. At the former station it, for the present, terminates. As soon as the whole line is completed, the telegraph will extend from the Paddington terminus to Bristol, and it is contemplated that information, of any nature, will then be conveyed to Bristol, and an answer received in town in about twenty minutes. Merchants and others, residing not only at the two extremities of the line, but at any of the intermediate stations (at all of which dial plates will be fixed, with competent persons stationed to work the telegraph), will then be enabled to avail themselves of the benefits and facilities of Messrs. Cooke and Wheatstone's invention. Two of the boys from the deaf and dumb assylum in the Kent road, have been at the Paddington station for five or six weeks, where they were instructed in the working of the machinery by Mr. R. Hutchison, and they are now perfectly competent to snperintend the telegraph at any one of the stations. A piece of machinery, simple but unerring, to which is attached a check-string to indicate to the boys when the signal is sent up to the line to show that something is about to be telegraphed, has been invented by Mr. Cooke, which enables these lads to perform this duty as efficiently as if they were not suffering under the deprivation of hearing and speech. The telegraph has now been in operation for nearly twelve months, and not the least obstruction to its working, by any of the wires, &c., becoming out of order, has yet occurred. Should such an event take place (especially when the whole line is open to Bristol), it might occur to many that there would be considerable difficulty (as all the wires are enclosed in a hollow tube, not more than about an inch in diameter) in ascertaining, throughout the 117 miles, the precise point at which the injury required to be repaired; but this apparent difficulty has been met by Mr. Cooke, who has invented a piece of mechanism which is contained in a mahogany case, not more than eight inches square, by which means the precise spot on the line where the injury might have been occasioned, would be indicated in an almost incredibly short space of time. The invention may now by termed perfect in all its details, and only awaits the completion of the line of railway to Brtstol to bring it into full operation between that city and the metropolis.—*Mining Journal.*

For the American Railroad Journal and Mechanics' Magazine.

METEOROLOGICAL RECORD FOR THE MONTHS OF MARCH and APRIL 1840
Kept on Red River below Alexandria La. (*Lat.* 31.10 *N. Long.* 91.59 *W*)

1840	Thermometer.					
May	Morn.	Noon	Night.	Wind.	Weath.	Remarks.
1	74	82	81	sw	clear	heavy thunder N to NE no rain
2	76	86	82	sw high	..	
4	76	87	82	sw light	..	
4	74	87	80	calm	..	foggy morning
5	70	84	70	..	..	heavy clouds in the NW
6	74	86	81	s	cloudy	light showers in the morning
7	78	80	77	sw	..	light showers all day, heavy thunder NE
8	72	88	86	..	clear	lightning in the SE all night
9	62	64	58	N	cloudy	
10	58	68	67	..	clear	
11	60	71	70	SE	..	Red river over its banks and rising fast
12	62	72	67	..	cloudy	
13	64	73	71	s	clear	
14	62	76	70	..	cloudy	thunder shower in the evening.
15	66	76	73	..	clear	thunder in the west, no rain.
16	68	80	72	..	..	
17	68	78	76	..	..	light shower in the evening
18	71	81	78	SE	cloudy	Red river continues rising
19	73	84	78	calm	clear	
20	72	82	75	N	..	
21	66	80	74	calm	clear	
22	66	80	74	..	..	
23	70	80	76	..	cloudy	
24	70	82	72	..	clear	evening light shower form NW
25	70	81	72	..	cloudy	showers all the forenoon
26	66	76	72	..	clear	
27	68	80	75	..	..	
28	70	83	76	..	..	
29	71	81	75	N	..	
30	74	83	75	calm	..	Red river still rising.
31	73	82	74	..	..	up to high water mark
	69	80	74			mean temp. of the month 74.3
June						
1	72	88	81	sw	clear	
2	72	88	83	w	..	
3	74	88	82	..	..	Red river at a stand, at its highest water mark
4	75	90	85	calm	..	smoky hasey atmosphere
5	76	91	83	s	..	
6	72	82	79	calm	..	Red river commenced falling
7	70	77	74	NW	..	in the morning a gale from w to N heavy thun-
8	65	76	75	..	..	der balance calm and clear
9	66	81	78	calm	..	
10	74	80	71	E	cloudy	
11	70	80	78	calm	clear	
12	72	84	82	SE	..	afternoon heavy thunder—no rain
13	74	85	78	calm	..	
14	75	85	84	..	..	
15	75	85	80	SE	..	Red river fallen one foot—and within its banks
16	73	84	78	..	..	
17	75	80	80	calm	cloudy	rain light all night
18	74	77	74	..	..	morning light showers heavy rain afternoon
19	72	75	73	..	..	light showers [and evening showers all night
20	72	75	78	..	..	morning and evening clear
21	75	82	86	..	clear	evening thunder shower
22	74	78	77	SE	cloudy	showers all day
23	76	80	78	s	..	light showers afternoon
24	77	87	83	sw	clear	
25	80	86	82	SE	..	
26	76	88	84	..	..	
27	76	80	86	s	..	
28	76	92	86	..	..	
29	77	90	86	..	..	
30	77	91	86	..	..	
	74	84	80			mean temp. of the month 79.

Use of the Walnut Tree.—Walnuts yield half their own weight in oil, whose flavor is considered to equal that of the finest Lucea oil. This very fruitful tree, which we see flourishing along the high road, and in the orchards of peasants, is one of great utility to the German: his furniture is made of it; the leaves dye a good black; and he feeds his cattle on the shells of the nuts that have supplied his oil.